

## **REMARKS — General**

By the above amendment, Applicants have amended the claims to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention patentably over the prior art.

### **The Rejection Of The Claims Under § 103**

1. The last O.A. rejected claims 1, 6, 7, 9-11, 16, 20, 21, and 23-25 under 35 U.S.C. 103(a) as being anticipated over Mohamed, et al. US 6,925,438 B2 (hereinafter Mohamed), and further in view of “An affine coordinate based algorithm for reprojecting the human face for identification tasks” Kuntal Sengupta and Jun Ohya (hereinafter Sengupta).

Applicants amended the claims as follows:

### **The Rejection Of Claim 1 on Mohamed and Sengupta Overcome**

2. Applicants respectfully request reconsideration of the rejection for the following reasons:

(1) Novel and unobvious approaches in applicants’ system are clearly foreign to Mohamed and Sengupta. Especially, one of the co-inventors of the present invention, Kuntal Sengupta, is also one of the authors for the prior art, “An affine coordinate based algorithm for reprojecting the human face for identification tasks”, and the co-inventor clearly notes that it is unobvious how to derive from the prior art to the present invention.

(2) There is no justification in Mohamed and Sengupta, or in any other prior art separate from applicants’ disclosure, which suggests that these references be combined, much less be combined in the manner proposed.

**Novel And Unobvious Approaches In Applicants' System Are Clearly Foreign To  
Mohamed And Sengupta**

3. Mohamed and Sengupta do not disclose key ideas in applicants' specification. Especially, one of the co-inventors of the present invention, Kuntal Sengupta, is also one of the authors for the prior art, "An affine coordinate based algorithm for reprojecting the human face for identification tasks", and the co-inventor clearly notes that it is unobvious how to derive from the prior art to the present invention.

The novelty and unobviousness of the invention in claim 1 are based on at least the following five points over the prior arts.

(1) Fundamentally, Mohamed and Sengupta lack explicit disclosure of automatic demographics measurement.

Sengupta is entirely foreign to the automatic demographics measurement.

Mohamed only superficially noted a usage of gender and race information "to better inform the automatic selection of a particular head model" in "For example, automatic face recognition, iris recognition, gender recognition, age estimation, race recognition, speaker verification, and/or spoken/written language identification can all be used to better inform the automatic selection of a particular head model for use as described herein. Such modifications, alterations, and combinations are to be viewed as being within the ambit of the inventive concept." (Mohamed, column 7, lines 2-7). Mohamed does not teach any methods of automatic demographics measurement.

Whereas, as one of the key steps in the present invention, applicants explicitly teach an exemplary method of automatic demographics measurement “to determine the race and gender of the person in the images” in (Applicants’ specification, page 8, lines 11-22), including “learning phase” and examples of demographic classifiers.

(2) Specifically, Mohamed and Sengupta are foreign to the specific automatic demographics measurement using Support Vector Machine (SVM) as disclosed in applicants’ specification.

Mohamed and Sengupta are entirely foreign to the Support Vector Machine (SVM), whereas applicants teach how to use the Support Vector Machine (SVM) as the specific demographic classifier in (Applicants’ specification, page 8, lines 11-22).

(3) Selection of a face model specific to the demographic recognition of the person as an approximate face model, whereby calculation of affine coordinates using demographic dependent constant can be facilitated by the chosen approximate face model, is foreign to Mohamed and Sengupta.

Sengupta explicitly teaches a usage of a “generic 3D face model” in (Sengupta, page 341, column 1, lines 40-41) rather than a face model specific to the demographic recognition. Sengupta is entirely foreign to the idea of selecting a face model specific to the demographic recognition of the person as an approximate face model.

Mohamed noted, “animation can be achieved through use of a 3-dimensional model of the subject head that includes a graphical representation (typically expressed as a collection of

nodes and links that collectively describe the geometry of the speaker's head” in (Mohamed, column 3, line 63 – column 4, line 17). Mohamed also noted, “a variety of input criteria can be utilized to permit selection of an appropriate head model. For example, automatic face recognition, iris recognition, gender recognition, age estimation, race recognition, speaker verification, and/or spoken/written language identification can all be used to better inform the automatic selection of a particular head model for use as described herein.” in (Mohamed, column 6, line 67 – column 7, line 7). However, Mohamed is foreign to the selection of a face model specific to the demographic recognition of the person as an approximate face model to facilitate the calculation of affine coordinates using demographic dependent constant.

Whereas applicants explicitly noted the selection of a face model specific to the demographic recognition of the person as an approximate face model in “For a given set of face images of the person, the race and gender is determined, and a face model, specific for that subclass (for example, male-Caucasian is a subclass) is chosen as an approximate face model by the subsystem 205 in the exemplary embodiment shown in FIG. 2.” in (Applicants’ specification, page 9, lines 1-4 and page 5, lines 5-7). Applicants also discussed the calculation of affine coordinates using demographic dependent constant in (Applicants’ specification, pages 10-13). The usage of the face model is also described in “For face modeling application, the Euclidean coordinate values of the template model's eyes, nose and mouth position are used, from which the Euclidean structure of the subject's face is generated.”(Applicants’ specification, page 13, lines 16-18).

(4) Combination of demographic recognition with affine coordinate based mesh adjustment technique face modeling is foreign to Mohamed and Sengupta.

Mohamed and Sengupta do not explicitly teach the idea of combining demographic recognition with affine coordinate based mesh adjustment technique face modeling.

Furthermore, the combination of demographic recognition with affine coordinate based mesh adjustment technique face modeling in the present invention produces results that are useful over the prior arts. Mohamed and Sengupta are foreign to this.

For example, both applicants and Sengupta noted about a demographic dependent constant. Applicants noted, “Here,  $a_4$  is known and is a race and gender dependent constant.” in (Applicants’ specification, page 12, lines 11-12), and Sengupta noted, “Here, we assume that  $a_4$  is known (our conjecture at this point is that it is a race dependent constant).” in (Sengupta, page 341, column 2, lines 14-16).

However, since Sengupta is entirely foreign to the idea of selecting a face model specific to the demographic recognition of the person as an approximate face model, Sengupta is further foreign to the idea that the calculation of affine coordinates using demographic dependent constant can be facilitated by the chosen approximate face model specific to the demographic recognition. Mohamed is foreign to this.

(5) The idea of locating four landmarks on the face of the person based on the facial feature detection is foreign to Mohamed and Sengupta.

Sengupta does not teach an idea of locating four landmarks on the face of the person based on the facial feature detection. Sengupta noted, “We first select four significant features in

each of the two input face images.” (Sengupta, page 341, column 1, lines 42-43). There are no explicit teachings of locating four landmarks on the face of the person based on the facial feature detection in Sengupta.

Whereas applicants noted, “The facial feature extraction stage located the four important landmarks on the human face: the location of the eyes, nose and the mouth.”(Applicants’ specification, page 11, lines 12-13). Applicants discussed an exemplary facial feature detection from images in (Applicants’ specification, page 17, line 15 – page 18, line 10). Mohamed is foreign to this.

**Mohamed And Sengupta Do Not Contain Any Justification To Support The Combination, Much Less In The Manner Proposed**

4. Sengupta disclosed “An affine coordinate based algorithm for reprojecting the human face for identification tasks”, and Sengupta is used as one of the exemplary components in the present invention. However, Sengupta does not explicitly teach a method for the automatic demographics measurement. Sengupta is entirely foreign to the idea of using SVM based demographics to enhance the three dimensional face modeling.

The processes of SVM based demographics classification is a nontrivial task in the practiced art. Furthermore, the process of using the nontrivial task of SVM based demographics to enhance the three dimensional face modeling is unobvious.

As the last O.A. also noted Mohamed does not explicitly teach using affine coordinate based mesh adjustment for said face modeling.

Therefore, there is no logical reason to support the combination. Mohamed and Sengupta are lack of key features presented in the present invention, and the prior arts do not contain any justification to support the combination, much less in the manner proposed.

Furthermore, as one of the co-inventors of the present invention, Kuntal Sengupta notes that it is unobvious how to derive the novel and unobvious features from the previous work in “An affine coordinate based algorithm for reprojecting the human face for identification tasks” to the present invention. The same co-inventor notes that there is no logical explanation and connection that his previous work in the prior art (Sengupta) can be combined with the Mohamed to produce the same result as in the present invention, because the prior arts do not explicitly teach the novel and unobvious features in the present invention.

The novelty and unobviousness of the invention in claim 1 are discussed based on the five points over the prior arts above.

### **The Dependent Claims Are a Fortiori Patentable Over Mohamed And Sengupta**

5. Dependent claims 6-7, and 9-11 incorporate all the subject matter of claim 1 and add additional subject matter, which makes them a fortiori and independently patentable over the references.

Applicants amended the claims 6-7, and 9-11 as follows:

6. Regarding claim 6, claim 6 further adds, “a step of using affine lines and their slope adjustment, which is proportional to depth of the point, for model estimation.”

Although Sengupta teaches the idea of using affine lines and their slope adjustment, which is proportional to depth of the point, for model estimation, Sengupta is entirely foreign to the idea of combining this with the selected approximate face model based on the demographic determination (Applicants' specification, page 9, lines 1-4, and page 5, lines 5-15).

Mohamed is entirely foreign to this.

7. Regarding claim 7, claim 7 has been canceled.

8. Regarding claim 9, claim 9 further adds, "a step of using the affine line properties for re-projecting a matched pair in two images to a third image, once four facial landmarks are located in all of the three images".

Although Sengupta teaches the idea of using the affine line properties for re-projecting a matched pair in two images to a third image, once four facial landmarks are located in all of the three images, Sengupta is entirely foreign to the idea of "(b) locating four landmarks on the face of the person based on the facial feature detection," in claim 1, which claim 9 depends on, at "The facial feature extraction stage" (Applicants' specification, page 11, lines 12-13). Applicants discussed an exemplary facial feature detection from images in (Applicants' specification, page 17, line 15 – page 18, line 10), and Sengupta is foreign to this.

Mohamed is entirely foreign to this.



9. Regarding claim 10, claim 10 further adds, “a step of using a single view to crudely model the face based on gender and ethnicity and then use anthropometric measures for identification”.

Since Mohamed and Sengupta do not explicitly teach a method for automatic demographics measurement, Mohamed and Sengupta are foreign to the application of the automatic demographics measurement to facilitate the usage of the anthropometric measures for identification.

10. Regarding claim 11, claim 11 further adds, “a step of using multiple views to model the face in the image based on the combination of the demographics and the affine line properties and then use the anthropometric measures for identification purposes”.

Since Mohamed and Sengupta do not explicitly teach a method for automatic demographics measurement and Mohamed and Sengupta are foreign to the idea of combining demographic recognition with affine coordinate based mesh adjustment technique face modeling, Mohamed and Sengupta are further foreign to the application of the automatic demographics measurement to facilitate the usage of the anthropometric measures for identification.

11. Dependent claims 17, 20-21, and 23-25 incorporate all the subject matter of claim 16 and add additional subject matter, which makes them a fortiori and independently patentable over the references.

Applicants amended the claims 17, 20-21, and 23-25 as follows:

12. The last O.A. rejected claim 17 under 35 U.S.C. 103(a) as being unpatentable over Mohamed, Sengupta, and further in view of Marshall, et al. 3,740,466 (hereinafter Marshall).

Applicants respectfully request reconsideration of the rejection for the following reason.

Regarding claim 17, claim 17 further adds, “a hardware system consisting of disparate cameras at disparate locations, images from which are used for said face modeling, whereby usages of the disparate cameras comprise multiple processing of the face modeling for multiple users”.

Although, as the last O.A noted, Marshall teaches a surveillance system for capturing images of individuals using disparate cameras at different locations (Marshall, FIG. 1, and column 7, lines 25-41), Marshall is entirely foreign to the idea of automatic demographics measurement and face modeling.

Since Mohamed, Sengupta, and Marshall do not explicitly teach a method of determining the race and gender of a person in the images, Mohamed, Sengupta, and Marshall are further foreign to the idea of using disparate cameras for determining the race and gender of a person in the images and combining the demographic recognition with affine coordinate based mesh adjustment technique for face modeling.

13. Regarding claims 20, 23, 24, and 25, applicants amended claims 20, 23, 24, and 25, which recite limitations that are similar and in the same scope of invention as to those in claims 6, 9, 10, and 11, respectively, above. Therefore, applicants respectfully request reconsideration of the amended claims 20, 23, 24, and 25, for the same reasons as stated above in regards to claims 6, 9, 10, and 11, respectively.

14. Regarding claim 21, claim 21 has been canceled.

15. Accordingly applicants submit that the dependent claims are a fortiori patentable and should also be allowed.

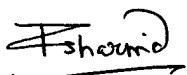
## CONCLUSION

For all the above reasons, Applicants submit that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore they submit that this application is in condition for allowance now, which action they respectfully solicit.

## Conditional Request for Constructive Assistance

Applicants have amended the specification and claims of this application so that they are proper, definite, and define novel structure, which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, Applicants **very respectfully request** the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition.

Very respectfully,



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